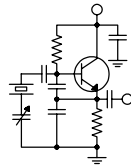


The Local Oscillator



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The Big Project

Last month, for the first time in many years I was personally and intimately involved in a transmitter site construction project. The project was the relocation of the KLVZ daytime facility to a new prefabricated Oldcastle building on the existing site north of Denver. During this project, I was reminded of a number of things I had forgotten since my last time in the field and I learned some new things as well.

The first thing I was reminded of was that projects like this are a lot of hard work! Regular readers might recall that we spent the first few months of this year getting the steel I-beam and concrete pier foundations constructed, the new 30-ton concrete building set in place and the power turned on. The new building has sat ready for occupancy for the past three months while we waited on the spring thaw and then on the general contractor to fit us into his schedule. It was a lot of work getting the building to the site, on its foundations and ready to go, but that was just the beginning. In fact, that was the easy part!

D-day was set for Monday, May 18 by the general contractor (Mike Kilgore), who would be available on that date to give us his full attention for a



solid week. On that morning, our crew consisting of Amanda Alexander, Keith Peterson and myself began uninstalling the old equipment including phasor,



transmitter and rack equipment.

The old building was a 1970s-vintage construction trailer set up on concrete piers, and the power, control, transmission and sample lines came up out of the ground in PVC conduits beneath it. From there, they wound their way through the floor joists of the trailer and then penetrated the floor into the interior. We carefully disconnected the three sample and three transmission lines, threading them back through the floor and joist and pulling out the slack. Then we had to cut off the PVC conduits a foot or so above ground level without damaging the cables within. That was fun and exciting, but we got it done.

We disconnected the phasor, transmitter, audio and control wiring and electrical feeds to the towers and equipment, essentially getting everything ready to be removed from the old building, while the general contractor dug a 250-foot trench from beneath the old building to the new one. A delivery truck brought us 1,000 feet of 2- and 3-inch PVC conduit, elbows and connectors and we unloaded that. By the end of the day, we were pretty much on

schedule, ready to begin unspooling 1,800 feet of transmission and sample line plus 1,600 feet of electrical, control and CAT5 cable and installing it in conduit.

Tuesday was probably the hardest day, but we had some good help. Our friends from NRC Broadcasting (many thanks to CE Mark Smith and helper Shay Awedia!) came and helped us unspool and cut the cables, lay it out beside the trench and then sleeve the PVC conduit over it. That was another thing I relearned – a 10-foot stick of schedule 40 PVC conduit is heavy, especially when sleeving it over a bundle consisting of three 3/8-, two 1/2- and one 7/8-inch transmission lines! We didn't get a lot more done that day, but by the end of the day we did have all those cables in the ground.

Wednesday was moving day – and much, much more! Again, our friends from NRC were on hand to assist along with some contract labor (Steve Zgorzynski) and a very capable electrician with whom we had worked on several prior occasions (Ryan). While Mark worked installing splices in the sample and transmission lines, Ryan and Steve worked on finishing the conduit runs into the new building – no small feat when they're full of coax! And while all that was going on, Mike was using a grinder to remove the bottom 4 feet of the stop portion of the steel door frame in the new building. This would, we hoped, provide us with enough width to get the 35-1/4"-wide phasor through the 34-3/4" door!

We had a forklift on hand to help us get the equipment from one elevated structure to another, but that phasor was a bear. We removed it in its normal (upright) position, but to get it into the new building we had to lay it on its back and slide it in longwise. With the 1/2-inch stop cut off the striker side of the frame, it fit with a millimeter or two to spare! Of course then we had to find a way to stand it back up –



not easy with the overhead cable ladder soaking up all the headroom!

The transmitter was much smaller and there were no issues getting it through the door, but it was also a lot heavier and harder to move. But by late afternoon, we had phasor, rack and transmitter all lined up in their permanent locations. Before he left, Ryan connected the new power cables to the new electrical panel so we could light the towers. Amanda had notified the FAA on Monday that the lights would be out, so we were covered until that time.

Thursday was installation day. Amanda and I wired up equipment while Ryan made the electrical connections to the phasor, rack and transmitter and connected the current sensors on the tower light circuits. The transmission lines were the biggest



challenge. The line to tower 1 ended up about six feet short, so I had to make a temporary "connectorless" splice. We have since installed a permanent splice with connectors.

In the old building, the transmission lines entered the phasor from beneath, through the floor. In the new building, they would come in through the top. Obviously, some field redesign of the phasor was needed, and that took some time. Temporary re-plumbing was done with strap and a few days later replaced with plated tubing and plated strap.

Using the network analyzer, I carefully tuned the sample lines. Actually I didn't have to because we were so careful to cut them to the same physical length – the resonant frequencies were all exactly the same and the characteristic impedance was the same within half an ohm or so.

By late that evening, we were ready to put some power into the phasor and see what happened. The event was largely anticlimactic. The parameters were close and we had them nailed within a few minutes. By the time we left late that night, KLVZ was ready to go on the air from its new building. At pattern change the following morning, Autopilot

switched to the new site without problem.

Friday was spent chasing down some bad wiring between the old building and one of the towers as well as in moving the burglar/fire alarm system from the old building to the new. Keith also got the video surveillance system working and the cameras all pointed at their respective towers. By the end of that day, the site was 100% operational. I, on the other hand, looked and felt like I had been in a bar fight and lost!

And that brings me to the last thing I learned on this project – that I'm not as young and physically agile as I used to be! As I write this a full week after the end of the project, I continue to nurse cuts, scrapes, bruises and the overall soreness that I got free of charge with the project! Still, it was rewarding and enjoyable – rewarding in the way that only such a project can bring the gratification of a job well done, and enjoyable in that I have always enjoyed project work, especially AM antenna projects.

I am grateful to God for good (but hot!) weather during the project and that everything worked out. I am also grateful for all the good help we got from folks like Mark Smith, Shay Awedia and Steve Zgorzynski, and of course from our own CBC engineering crew, Amanda Alexander and Keith Peterson. Good job, all!

A full set of project photos is online at <http://www.crawfordbroadcasting.com/KLVZ Pics>.

Moment Method Application

Phase 2 of the KLVZ daytime site project was really an adjunct – modeling the directional antenna and relicensing it under the new AM

technical rules that permit model-proofing of such arrays. This was always the plan, but tying it in with the move project seemed to be the most efficient use of time and resources, since we were already in the field with the required test equipment.

Early last month, Amanda and I spent an evening at KLVZ making base impedance matrix measurements for the model. Between then and the start of the big project, I got the model built, calibrated and run and most of the documentation done. When we completed the move, because we had calibrated/proofoed the sample system as part of the move, just a few tasks remained: adjusting the array to the model parameters, tuning the ATU networks to match the transmission line impedance and making the reference field strength measurements. We did all that in one day on the last Thursday in May, and by the end of that day, the station was operating on the new model parameters.

It took most of the following day to complete the documentation, and we have since filed it with the FCC. At the last official count, the FCC has received seven such applications, and in addition to the KLVZ app, I know for sure of one other being filed, so that likely makes KLVZ's moment method application number 9.

It's great to have this option, and in the case of KLVZ it will provide relief from the constantly changing situation with respect to the construction cranes located just a mile or so from the site in the main lobe. I look forward to filing such applications for a number of the directional arrays within our company.

The New York Minutes **By** **Brian Cunningham, CBRE** **Chief Engineer, CBC – Western New York**

Hello to all from Western New York!

Over the past several months, I have been watching economic trends in our nation's spending habits. With all of the billions of dollars our government has handed out to various industries to keep them afloat (most notably the auto industry), why do they continue to spiral downward at record pace? Chrysler and General



Motors are on the doorstep of bankruptcy, yet our government continues to financially support the auto industry. Instead of allowing the auto manufacturers to squander this money on elevated salaries and bonuses, guidelines should have been put in place as to how this money should be spent.

And the problem doesn't just rest on the auto industry. As I see it, this money meltdown began two years ago when banks began

selling off bad mortgages that should never have been approved in the first place. American workers were living well above their means, and credit card companies were all too generous in opening lines of credit with ridiculous interest rates at the onset, only to have those rates escalate to over 30 percent when the borrower couldn't meet the payback terms.

This was a calculated gamble by the nation's banking institutions, fueled mostly by greed. They were relying on consumers "impulse buying" of items that were not essentials. What Americans have been doing for the past 15 years is mortgaging the future for the present, indulging themselves in consumer goods and services with no thought to that point in time when payment would come due.

We have been so busy recently worrying about our own personal problems, that we are not noticing that our country itself is going bankrupt. As a nation, the American people tend to spend more than they earn, consume more than they produce, and go deeper and deeper in debt, living for today and hoping tomorrow will somehow take care of itself.

The United States is rapidly being transformed from a world-class industrialist to near third-world poverty. Unemployment, at close to ten percent, is reaching a level not seen since the Great Depression of the 1930s. The difference between poverty and wealth has never been clearer, except that now there seems to be a lot more poor people than ever before. The rich entrepreneurs are squeezing the middle class out of existence. The downsizing of the middle class has not been caused by the rich, but brought upon ourselves by the lack of concern for our finical future.

At some point in time, we need to wake up and realize that we are selling ourselves and our country off, piece by piece. Since the 1980s, we have been spending money insanely, money that was subsidized by foreign governments. These governments are taking the profits and financing more than half the Federal budget deficit, and they are buying huge chunks of U.S. real estate and stock in our biggest corporations for pennies on the dollar. This is causing the United States to lose its economic sovereignty. Key finical decisions are no longer made in Washington or on Wall Street, but in Tokyo, Frankfurt, London and Toronto as well.

The American Heritage Dictionary defines affluence as: "A plentiful supply of material goods or wealth." Our government is based upon the notion or idea that each American has an equal opportunity in the pursuit of affluence, as stated in our Constitution. Regretfully, many Americans have all but given up hope that they will ever attain any degree of

affluence, once our nation gets back it's feet. Our nation's leaders must strive for a solution to our economic dilemma that will be long term and beneficial to all Americans.

WDCX-FM – Buffalo, WDCX(AM) / WLGZ-FM – Rochester

At the beginning of last month, the WLGZ transmitter was shutting down with a plate breaker trip. There were no overload LEDs lit to indicate what possibly could have triggered the plate breaker to trip off. I reset the breaker, attributing it to perhaps a spike in the incoming AC power. After a few days, the breaker tripped again, with no faults indicating on the Continental's front panel.

I recall having this problem with another transmitter years ago, and a replacement of the electrolytic capacitors on the three SCR gating cards took care of the problem. On Monday, May 4th I replaced all nine of the caps on the gating cards, and so far we have not experienced any trips of the plate breaker.

While checking the tuning of the transmitter after replacing the caps, I noticed that the tube is getting weak, as indicated by the fluctuation of output power while adjusting the filament voltage. The tube has been in service for close to two years and has well exceeded its life expectancy of 8 to 9 thousand hours.

I cringe at the thought of having to change the final tube out, as past history on remanufactured tubes installed in this transmitter has been less than stellar. I have always used Econco rebuilds, but the past several replacements have been a nightmare, with us having to switch out the tube several times before we got a good rebuilt tube. Many years ago, I used to use Freeland rebuilds regularly, but have not dealt with them in over twenty years. If any of you are using Freeland rebuilds, drop me a line and let me know about your experiences with them.

Hopefully, this summer will stay dry enough for us to get the tower painting done for the six 290-foot towers at the WDCX(AM) transmitter site. This work was scheduled to be done last year, but rain kept delaying the painting. Once fair weather did get here, it was too late in the fall to attempt getting all of them done. While Western Antenna & Tower is painting, I will be performing some much-needed maintenance on each tower's doghouse, such as replacing the vent soffit, painting the weather-worn wood trim around the roofs along with the metal doors and frames.

In Buffalo, everything is good at the WDCX-FM transmitter site. It was just a year ago in

May that we began broadcasting out of the new Thermo Bond transmitter shelter. I can hardly believe how much better and cooler the equipment runs with the air conditioning, not to mention the fact that everything stays much cleaner! We did not have any air-conditioning in our old cinder block building and very poor ventilation into and out of the structure. The room temperature on an average summer afternoon well exceeded 175 degrees on most days,

cooling down to around 110 degrees at night. Certainly not the ideal conditions for a transmitter plant. Operations at each of the studios are running smoothly, with no major problems to report on.

That about wraps up another month here in the great Northeast, and until we meet again here in the pages of *The Local Oscillator*, be well, and happy engineering!

The Motown Update

By

Tom Gardull, CBRE
Chief Engineer, CBC–Detroit

WMUZ does not do many remote broadcasts anymore, but we still do our big Law Day remote at a client's law offices. It's a big production since we originate the telephone-talk broadcast outdoors in the parking lot alongside a family festival. We have a clear signal path for the Marti transmitter to send back to the studio from the top of their three-story building. We listen to ourselves with a local live mix into the headphones and speakers, supplementing the mix-minus returns from the studio.

We have IFB talkback mix-minus on our FM SCA 67 kHz channel for host headphones, and we place mix-minus with no talkback on FM SCA 92 kHz for the PA feed to the crowd, with the local wireless microphones mixed back in. Our 40-second obscenity delay with the 8-second HD diversity delay means no direct air reception for a live event. Frequency response over an SCA channel is not full FM fidelity, but still sounds good – especially for a telephone-talk program.

In the past, we suffered with the SCA channels fading in and out, breaking up and having too much hiss content. These phenomena were particularly noted as the crowd grew larger and stood in front of the broadcast table. This year we did not have those problems. I was using all the same reception equipment, antennas and setup as before, but the one major change was having our new solid-state FM transmitter. All the previous problems were symptomatic of multipath interference. Our new

transmitter has lower AM noise, which means fewer multipath reflections. This was an unexpected benefit of our new transmitter installation. This was the best monitor audio quality we have had at this event.

I was still unable to get our new NV-40 FM transmitter to modulate the built-in SCA generators, so I again used our external SCA generators. I did not have the time to test how sharp the baseband filters acted, so I shut down the RDS generator operating on 57 kHz for the duration. In the past, the RDS 57 modulation was picked up by the SCA 67 receiver as very noticeable noise. This interfering noise is way too objectionable for the host's headphone listening, so we do without RDS for a few hours. I want

to try a far-field experiment leaving the RDS on to measure its impact on SCA 67 with this new transmitter. RDS vs. SCA filtering was one of the improvements I had hoped to hear by using the internal SCA generators, but that will wait for the next remote after some help from Nautel.

Our remote started out with a problem of way too much hiss covering the main audio sent back to the studio. Many years of transmitting from this location gave us the confident experience of always getting a full-quieting signal at the receiver. Either we were not transmitting 40 watts or our receiver had a problem. Since the transmitter meters looked normal, I had to check the receiver end. I got back to the station after the host's first break. My first suspect was the antenna connections. The last six feet of line



to the receiver is an RG-8 jumper. The N-connectors were tightly screwed on to the foam coax and frame, but I pushed upward on the coax jumper probably making the center pin seat more firmly. That was the solution and the signal strength meter jumped to full scale. We had studio quality audio for the remaining

three hours.

Our event went well with a good crowd. A lot of kids' bike helmets along with hot dogs and pop were given away by the lawyers, and a dunk-tank was used by our talk host on a chilly day.

News From The South

By

Stephen Poole, CBRE, CBNT, AMD
Chief Engineer, CBC-Alabama

A Welcome Change of Subject

You're probably just as tired of hearing about rain as I am of writing about it, so I thought I'd change the subject. Instead of mentioning the horrible weather again, I want to do another hands-on article about station networking. Consider this another in the endless series of "things that you need to know nowadays, but for which simplified and practical information isn't readily available."

To set this up, imagine a typical workday. You might enter the IP address of a Web-capable remote control in your browser – say 192.168.1.200. Up comes the remote screen. You might then type in "www.digikey.com" to look up some parts. (You'd never enter "youtube.com" or something like that, of course, because you're a conscientious employee who doesn't goof off. Ahem.)

Have you ever wondered how the network knows whether an address is local or remote? How does it know that the remote control is on the local network, but that digikey.com's server isn't? It's not just the fact that you've entered "www.digikey.com." If you enter the "raw" IP address yourself (204.221.76.6 at this writing), you'll still go to their main page. Likewise, on some networks, you could enter a local specifier such as "//localhost/foldername" to connect in a file browser. The fact that you've used text instead of a "raw" IP address obviously doesn't tell the computer whether that address is local.

Basically, you could title this article, "How

Computers Find One Another." Understanding this will aid in troubleshooting common network problems. Unfortunately, most of the documentation for networking falls into two categories: it's either way too detailed and geeky, or it's a joy-joy feel-good overview that doesn't really tell you anything.

To keep this short and sweet, I'll focus exclusively on ARP, DNS and network routing. I'll have to assume some prior knowledge on your part: as long as you've at least set up a small local network with a typical DSL router/modem for shared Internet access, you'll be fine. Finally, I'll stick with what we

use: standard TCP/IP and classic 4-octet IPv4 addresses (ex., 192.168.1.200).

The Domain Name System (DNS)

You're already familiar with this, so I'll only mention a few extras and highlights. In essence, DNS is what allows you to use an easy to remember name like "digikey.com" instead of the raw IP address. If DNS is working properly on your computer, you can use that text as a synonym for the IP address.

Many years ago, everyone had a file on their computer with a name like "hosts." This contained the mappings for machine names to IP addresses (or whatever that particular network used). This legacy still lives with us: on a typical Windows system, the files "hosts" and "lmhosts" can be found in /windows/system32/drivers/etc. On a 'nix system (including Linux), the file /etc/hosts is used.

What many network administrators don't



know (or have forgotten nowadays) is that the computer always refers to these files *first*, before querying DNS. If you were to put “digikey.com” in the file with a made-up IP address, you’d get an error in your Web browser when you tried to go to Digikey’s site. Likewise, a Bad Guy (capitalized out of irreverence) might tamper with the “hosts” info to force someone to a bogus site. This is admittedly unlikely, but it’s worth mentioning.

A Sidebar: DHCP vs. Static IPs

Most networks nowadays use the Dynamic Host Configuration Protocol, DHCP to allow users to connect on the fly. The computer sends a request to the DHCP server, which provides everything it needs to connect: an IP address, netmask, default gateway and DNS.

But there will be times when you have to provide a static, unchanging IP (for that remote control, just to name one example). How can you obtain the needed info? Find another computer on the same network. Under Windows, start a command prompt, then enter “ipconfig /all.” Under ‘nix, log in as root, then use “ifconfig -a” to get the IP and netmask; “cat /etc/resolv.conf” will display the DNS information.

IP Addresses: Netmasks, the Prefix and the Host Number

This is where it can get really geeky. Attempting to explain network masking in great detail requires a knowledge of binary and the logical “AND” function. Do a Web search on this for more info (put on your foil hat to protect your brain from implosion first). Again, I’ll just hit the need-to-know highlights.

A typical IP address can actually be broken up into two parts: the *prefix* and the *host number*. That’s where the network mask (“netmask”) comes in. Most small networks use 255.255.255.0 by default; but what does that mean? As already mentioned, this is actually a logical AND function. Any place that a “1” bit in the IP address would correspond to a “1” in the mask, that’s considered part of the prefix. Anything left over (i.e., everything to the right of the prefix) is the specific host number on that subnet.

The important thing is that *this, in fact, is how your computer determines whether an address is local or remote*. Anytime it encounters an IP address, it applies the netmask to determine the prefix. If that address has the same prefix as the local network, it’s local. Otherwise, it’s considered remote and outside of the local network. Here’s an example from a

typical small network.

Netmask:	255.255.255.0
IP Address:	192.168.1.200
Prefix:	192.168.1
Host Number:	200

Therefore, this IP address refers to host number 200 on the subnet 192.168.1.0 (when writing a subnet, you always fill the host number portion, after the prefix, with zeros). Any other IP address that starts with “192.168.1” will be considered local by that host.

With a netmask of 255.255.255.0, you can have up to 253 different hosts on that subnet. (x.x.x.0 and x.x.x.255 in any IP address range are reserved for special functions, leaving 253 usable values.) If we change the netmask to 255.255.0.0, now only the first two octets of the IP address are considered prefix, and so on.

Try this experiment: take two machines and give them static IP addresses 192.168.1.100 and 192.168.2.101. Hook them together with a crossover cable, or with two standard cables and a small network switch. Start a command prompt and use the “ping” command to see if they can communicate: for example, from 192.168.1.100, enter “ping 192.168.2.101.” With a netmask of 255.255.255.0, they will NOT be able to ping one another. But change the netmask to 255.255.0.0, or change the third octet of the second IP from “2” to “1” and the ping will work.

There are plenty of fine details that I’ve left out; for example, when you lease a DSL line with a static IP address, your ISP might provide a netmask such as “255.255.255.252” (which means that everything but the last four bits of the IP address are prefix). So-called “classless internet domain routing” (CIDR) just specifies the number of “1” bits: for example, “192.168.124” would refer to the small network that we’ve been playing with. Again, do a Web search for more details; let’s move on to ...

ARP – The Address Resolution Protocol

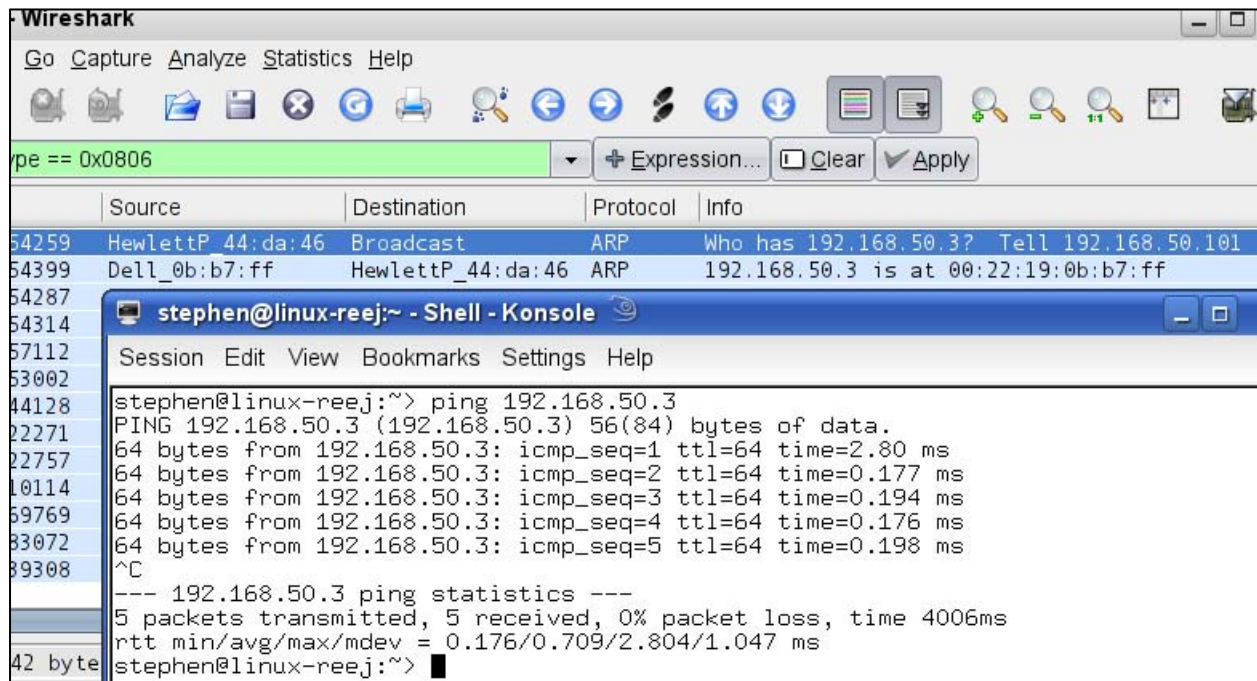
Now we start tying everything together. When you enter an IP address into your machine (or a text name that can be resolved to an IP address by your hosts files or DNS), the netmask is applied to determine if it’s local or remote. If it’s local, the machine does what’s called an *ARP broadcast*.

If you have a packet sniffer such as Wireshark on your computer, you can actually watch this process (see the figure below). In the illustration, I’ve pinged our mail server at local IP address

192.168.50.3; I'm at 192.168.50.101. My machine broadcasts a request to the entire network: "Who has this IP?" The mail server responds with its MAC address (00:22:19:0b:b7:0f). Now the Ethernet hardware, which always communicates from MAC to MAC at the local level, knows where to reach the mail server. The ping works (see the lower half of the

your *default gateway*. In this case, the default gateway will simply be the IP address of the DSL modem/router. Easy enough, huh?

The default gateway is called "default" for an obvious reason: if an IP can't be ARP'd, and no other routing has been specified, the request goes to the default gateway. More advanced routing is



picture).

If no machine responds to an ARP after a timeout (typically 30 seconds), that's when you get the dreaded "no response" error. (And incidentally, if more than one machines responds, that's when Windows pops up that little error box warning you that two devices on your network have the same IP address!) But the key point is: if the netmask provides a prefix that matches the local network, ARP is used. Otherwise, we go to a ...

Gateway

A "gateway," by definition, is simply an interconnection between different networks (i.e., those with different prefixes). In a really simple network based on a DSL router/modem, this is quite easy to follow. Once your computer has the destination IP address, it applies the netmask. If it's local, it tries to use ARP to find the local machine. If it's remote, though, it will send the request through

possible, but is beyond the scope of this article. Briefly, though, you could tell your computer, "if it's on subnet 100.100.0.0, use the gateway at 192.168.1.10." If your computer wants something at IP address 100.100.1.2, the request would be sent to that gateway instead of to the default.

For more information, do a Web search on "network routing" (and once again, have your tinfoil hat handy!).

Summary

Every time I write something like this, I'm amazed at how difficult it is to cover everything in a single article. There are so many details; so many things that I've left out! But this should get you started and you'll be able to troubleshoot common network complaints with this knowledge. Get Wireshark (www.wireshark.org) and play with it. Learn to build filters that will allow you to watch the communication between individual machines. Todd and I intend to cover this in a later article, but you can

start playing now!

Building on these basic principles, you can even start splitting your large network into smaller, easier-to-maintain subnets. The key is the netmask: with the common “small net” value of 255.255.255.0, you can simply define each subnet with different numbers in the third octet: 192.168.1.0, 192.168.2.0, and so on. Between the subnets, you’ll need a router that can act as a gateway. Todd and I want to explore that in a future article, too.

What this knowledge implies is perhaps more useful. If you want to stop a Windows(tm)

machine from accessing the Internet, simply convert it to a static IP address, then remove the default gateway and DNS information in the network settings. This won’t stop a skilled hacker, but it will prevent an automatic update from trying to install itself right in the middle of drive time(!). (Turning off Automatic Updates in your Windows settings will not stop third party programs from trying.) Plus, it will make it much more difficult for employees to browse the Web on that machine, possibly downloading a virus or other malware without your knowledge.

Until next time!

Gateway Adventures

By

Rick Sewell, CBRE

Chief Engineer, CBC–St. Louis

Spring is back and with a vengeance here in St. Louis. We are experiencing the typical spring electrical storms that hit their peak of the year from about mid March until late June.

This year has been no exception, and with the storms come some of the typical problems. Usually we get some kind of problem caused by the lightning or surges at one of our three sites about every third very strong electrical storm.

Fortunately, most of these problems can usually be quickly remedied by a power reboot. Of course how quickly that can be remedied is somewhat dependent on the drive time to get to the site if there is no one present at the time. However, I have had to reprogram a satellite receiver or EAS encoder/decoder over the past couple of weeks a few times. I also have had some devices that needed a bit more than a reprogram to get them back to operational status again.

One of the places where we get hit hard during the lightning storms is the KSTL transmitter site. Lightning just seems to take the station off the air whether we are running the on the main solid-state transmitter or on the auxiliary tube transmitter. It doesn’t seem to matter which transmitter is on the air during a strong storm in the vicinity of the transmitter site; you are going to have to turn the transmitter back on a few times during the storm.

We certainly have taken steps to improve the

performance of the site during the storms by grounding the tower and transmitter building better, but we still experience shutdowns during the storms.



We use to have a certain chip in the control card for the attenuator resistor network of the solid-state transmitter that used to get “smoked” with about every other storm that went through the site. This meant having to go to the backup transmitter until I could get out to the site and replace the chip. I used to order these chips in bulk at the beginning of every spring because I knew we would go through them like candy. I could only get them from the transmitter manufacturer, and a couple of years ago the price tag on the chip went

up to about \$11. So it was getting expensive to constantly replace them. I began to think of these as one of the fuses in the transmitter because they would go first, thus protecting the rest of the transmitter. It was kind of an expensive fuse to say the least.

It seemed I was running out of ways to improve the situation when I decided to play with the width of the spark gap in the ATU last year. It was an experiment that took a little trial and error because if you put the gap too wide, you lose the protection that spark gap would provide. On the other hand, if you set the gap too tight it will spark over constantly with just a bit static in the air and do this often enough to destroy this static-sensitive chip with almost every

storm that comes through the area (or so it seems). As I said earlier, with some trial and error I was able to find the right “gap” in the spark gap that would provide protection but didn’t jump constantly taking out the chip with it.

The results have been good over the last year. We still get knocked off the air quite a bit during storms, but we are able to turn the transmitter back on in short order and get back on the air –

provided that the board operator is paying attention. We have not had the constant loss of the chips that in the past caused us to have to go to the backup transmitter until I got out to repair the main.

In fact, despite a spring full of the normal electrical storms this year, at the time of this writing I have only had to replace one chip so far this year. So taking the time to make minor adjustments in the spark gap has definitely paid off.

Catalina Tales

By
Bill Agresta
Chief Engineer, KBRT

Greetings from Santa Catalina Island! After the trying month I wrote about in my last column, I am glad to report that things are doing pretty well here this month. God is always so amazing as He continuously shows me that He has everything under control here, even though things seem to get a bit crazy at times.

Just after a month filled with trials, my pastor was in need of some work and offered to come up and help out here at the KBRT transmitter plant. This was perfect timing since we needed to complete hauling the fire debris from last year’s fire to the dump and also complete our brush clearance, something that has turned into a never-ending job here. Pastor Enrique is an experienced general contractor who turned down a job at his dad’s large construction firm to instead become a pastor. Well, I am glad to have him back on the island as my pastor, but I am also very impressed at his skills as we work around the plant.

One of our major accomplishments last month was the mowing of our entire property. We used a large brush mower (D-R Brush Mower) for most of it and the steep hillsides were done by hand. Our entire building is now surrounded by ice plant, which makes

a great fire break and the place is looking better than I think it ever has. Someone also donated a large skid sprayer, so I can spray the property with Round-Up before we get overtaken with weeds again. This should bring the weeds back under control and allow maintenance to be done a couple times per year instead of continuously.

We also repaired our old tower fences and painted them along with the ATU houses, and they all look like new. This is the first time since I have been at

KBRT that all three of the tuning houses along with the fences not only match but are painted with the same camo-color as our towers. Did I get your attention? Yes, our KBRT towers are camouflaged to match the terrain, a deal made with the Catalina Island Conservancy years ago along with special permission by the FAA. It’s really a sight to see, or not see, if you are not looking for them. This has put me on edge a few times as I have seen some close calls with aircraft but most of them were doing things they were not supposed to be doing.

So, now that our field is in great repair, it’s time to focus indoors. I have already begun our quarterly deep-cleaning and this month I am also doing a few things to make our operation a bit more efficient to



Tuning houses and fences now all look great!

maintain but, that is a subject for next month.
Until next month, the Lord bless you and keep you;
the Lord make his face shine upon you and be

gracious to you; the Lord turn his face toward you
and give you peace.

The Chicago Chronicles

By

Art Reis, CPBE, CBNT, AMD
Chief Engineer, CBC–Chicago

In celebration of National Writer's Block Month, I was having a hard time coming up with something really hot to write about. It didn't help that I had shoulder surgery and was suffering under the after effects of anesthetic for a couple of days. Who wants to write about that?

Failure Modes for the Ages

Here's one for the books. At 5:20 AM on the Saturday morning of Memorial Day weekend, our big station, WPWX, went off the air. Awakened by the remote control's phoned-in alarm plus a call or two from my cohort James Kelly, I tried to revive the main BE FM-30T by remote control over the Internet (the *only* way to fly!) but was unsuccessful, so I fired up the Continental aux transmitter and headed out to the site to see what the deal was.

When I got there, I found the IPA was not properly functioning – no drive, no currents in the final tube, only plate and screen voltages and –what's this??? – *no* filament voltage!! Checking the status lights, I found all of them to be on (this thing was deluding itself into believing that it was still on the air!) and the Plate Overload LED was lit. I reset that, but it made no difference.

Now, there is no such thing as a filament circuit breaker in the transmitter, so I had all sorts of notions of a blown filament transformer, which would be a first in my experience – the final amp filament transformer is one of the more overbuilt parts of any big rig. There's a reason for that. I'll let you figure it out. If you can't, I'll tell you next month. Running out of ideas, I turned the filaments on and off several times, without any change in the outcome, except for one thing – the relay closure just didn't sound right. It was too (how shall I say this?) timid. Hmmm.

At that point, intuition began leading me to

the transmitter logic circuits. Might they be the culprit? There was only one way to find out. Kill it dead, the whole thing. I went to the wall, shut off the primary breaker (the FM-30T doesn't have one of those within it – that's what the wall breaker is for!) and waited. Cold reboot... you all know the drill. I turn the big breaker back on and fired the rig up again. Up she came. Peace at last.

You bet I called BE and told them about it..... right then. At 7:00 AM on a Saturday of a three-day holiday weekend. Just when they want to hear about it. According to the on-call technician I talked to, that experience was a first for him as well. That's when it feels good, telling the manufacturer about yet another previously unknown failure mode in their product (only kidding!). Hey, if I'm going to be rousted out of bed at 5:30 AM on *any* Saturday, I might as well make it worth my while. But in retrospect, it was one of those situations that makes an engineer feel good about himself. Catastrophic off-air emergency figured out and resolved in less than 90 minutes, including travel time. We should all be this lucky on a holiday weekend.

All right, break it up!

The reduction of our cap-ex budget has not sent us scratching for things to do here in Chicago. On the contrary, a lot of projects which have had to be put aside are now being resurrected and done, and it's a beautiful feeling to say the least. For one, the Beecher security light and camera project are now done. We wired the light in to go on and off with the tower lights, and the result is decent, albeit a bit blurred at night due to the overall lack of light. The real issue, however, is the slow pace with which the cameras send the data down to the person viewing the scenes on the Internet. Stay with me, folks – this



thread is going somewhere.

Couple that with the fact that CBC has launched a few of its signals on Flycast, which is an Internet audio service aimed at the folks with the Blackberries and other such “smartphones.” That additional overhead, plus that video from the transmitter sites, put our little router over the limit for throughput, and a long-dissed project was resurrected, namely the augmenting of said Linksys router, the one which immediately follows the ISP’s modem. Now, this is a Linksys BEFVP41 router, which is not much of a router, but which until recently had been quite adequate for the job. It just was overworked and had become something of a bottleneck. We figured we had to replace it, so we did a bunch of research with the help of our sales rep at PC Mall, and came up with what looked like a good, high-powered router to meet our needs. The thing is made by Adtran – we have a couple of their ISDN line modems for use as a phone line replacement as well as for ISDN voice purposes, and they work well. I think that’s why they’re now discontinued. (Only kidding!) The problem was the Adtran’s cost: nearly \$1,100! Oh, and don’t forget “the learning curve.” Remember that we were raised on Linksys routers, which with their web browser interfaces, are a dream-snap to install and configure. The Adtran ain’t built that way at all.

Even with those reservations, we took the project to Corporate. They were amenable as long as we got the blessing of our IT guru, Larry Foltran. By the time we got that word, it was past quitting time in Detroit, and Larry was gone for the day.

So James Kelly, our chief IT person in the department, and I sat down and noodled the situation through. James came up with what had been the original plan: We have five IP addresses available to us from our ISP, of which we’re using two. One is for our sales VPN and the other is for everything else in the building. Hmm, what *are* we hoarding those other three IP addresses for, anyway? Couldn’t we use them to split up the system? Think about it: Our streaming and Flycast functions could be on one router and the original IP address, the original sales/accounting VPN system, which is doing its job just fine, thank you, could be left alone (and will be), engineering functions, including transmitter remote control, security videos of the transmitter sites, and access by vendors to their equipment in our system could be accomplished on another IP address, the Internet for the entire building, complete with firewall and all the lockdowns, could be used by the fourth router and IP address, and the last IP address would be reserved for later use by our Zephyr IP system.

That is for a reason – we want no interference with Internet access to the ZIPs. This arrangement also could allow us to put up the firewall for all functions except Internet streaming. Why? Because IS heretofore hasn’t allowed firewalls to be turned on (to which I must ask, “What’s up with *that*?”)

And then, there’s the matter of cost. The BEFVP41 router, which is designed for the VPN we have, cost over \$125. Frankly, we don’t need that kind of power. The VP41’s little brother, the BEF41 router, costs a mere \$70. Figure the cost of three of those Linksys boxes vs. the cost of one big Adtran (\$1,100[!!]), and all of a sudden, this plan makes a lot more sense.

Armed with that knowledge, I felt blessed that I hadn’t gotten in touch with Larry on this subject at all. The next day, while on my trip out to Kirkland, I had a long talk with Larry, in which I endeavored to “sell” him on the revised plan. Larry gave it some serious noodling himself and emailed his blessing. Game over. The routers will be in place and the system configured by the time you read this.

I have to tell you –second thoughts really *do* save money in the long run. Thanks to James for that one.

Final Tubes — What is Happening Here?

I’d like to find out from some of you readers if you’ve encountered this problem in the last little while.

We’re running into a final tube issue with our backup Continental 816R4. The tubes are rebuilt and we’ve encountered the issue with two rebuilders. The tube is the Eimac 4CX15,000A, and only that tube (in our experience). We’ve just gotten a rebuilt tube from Freeland, a 4CX20,000A for the final in our BE-FM-30T, and that one is working just fine. But the two latest ‘15,000’ tubes are not working. Let me tell you a little about the failure mode:

First, the input tuning requires a significant amount of adjustment from a good tube to a marginal one. In my experience, that is a warning sign. Good tubes don’t require more than a turn or two of adjustment between them *after warmup*. Note that the input really should not be adjusted until after warmup, but adjusting it early is always the greatest of temptations.

Second, the tube doesn’t operate efficiently at all. Understand here, that this transmitter is operating at a little less than one-third of full output power, since the ERP for the aux is lower and that antenna is a lot bigger than is the main. In normal tube operation at the 8.8 kW at which this transmitter operates, plate voltage is somewhere between 5700

and 5900 volts, the plate current is around two amps (actually a little shy of it), the screen voltage is at about 675 (which on our rig is maxed out) and the screen current is about 150 milliamps. Grid drive is about 120 milliamps, and I can't remember the bias as I write this, but trust me, it doesn't change from tube to tube so don't worry about it.

On the other hand, on the rebuilt tubes we've been getting lately, the output cannot be brought over about 5 kW with the same plate voltage, the plate current is over 2.2 amps, the grid drive is about 80 milliamps, and the screen current is sitting at about 120 mils. Running the loading and tuning controls up and down does very little to make this situation right, and in any event, like the input tuning adjustment, you should have to do much to make the

transmitter work well anyway.

I've sent one tube back already and am about to send another with the same syndrome. I'm hoping that this isn't becoming pandemic. We have an older tube in the Continental right now which is working fabulously well, but even in occasional backup service, it will be only a matter of time before the filament starts to show its age. By that time, the case of the 4CX15,000A tubes had better be solved.

Until next month, blessings to you all, and for those who are wondering, the answer is yes, I'm still having a great many "missing her" moments. This grief thing really is going to take awhile. Thanks so much to you all for your love and support. Oh, and it looks like I solved the "writer's block" thing.

The Portland Report

By

John White, CBRE

Chief Engineer, CBC-Portland

Summer is in sight as the Portland Rose Festival nears. The weather prognosticators can usually simply pull out last year's prediction: *rain*. The average is usually that one year out of ten is sunny.

With summer comes repair work, in this case the tower repair work I mentioned a few months back. Now I have to admit here being a victim of future shock. In my world of structural steel there are machines called power saws and drill presses. For fancy parts a thing called a milling machine might be called into service. All of what I knew is so "yesterday" as modern technology continues to move forward. These days, a modern steel fabrication shop might have some of those machines in the back room while the real workhorse is the laser cutter. I knew, of course, that these machines existed; what I didn't appreciate is the extent to which they have become the standard tool of any steel shop.

I suppose that shouldn't be a surprise given the changes in the broadcast industry. The footprint we used to consider typical of a 250-watt transmitter now accommodates a 12 KW transmitter. Audio wiring is now digital, and the computer has become a

common tool.

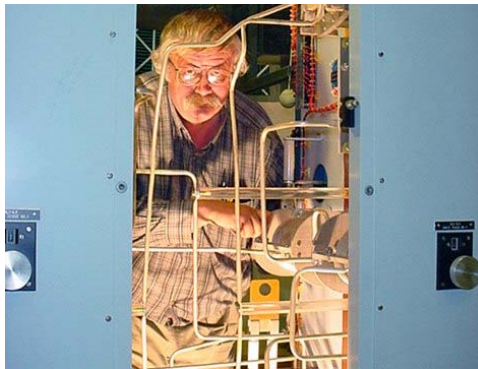
These computer-controlled steel cutting machines can cut, trim, shape and drill steel

construction members nearly as fast as the raw materials can be moved from the warehouse. And they can do that with much greater precision than the best tools of the past.

But (isn't there always a "but"?) the old computer rules hold. Garbage in garbage out. Any and every mistake in clearances, measurements, or calculation will be duplicated at great speed.

Just the same a properly laid-out part, pre-cut, hot-dipped galvanized and preprinted prior to installation is a great savings. One thing I have learned is the time it takes to do work on the tower is *never* less than estimated and is very often more. I have also learned that work on a tower takes four to ten times as long as the same work done on the ground. The bottom line: get the preparation work right on the ground.

The downturn continues in Oregon with the latest statewide unemployment numbers above 12% and above 15% to 19% in some parts of the state. These numbers are moderated somewhat as the



governor created 12,000 part-time temporary state jobs last month.

Many here in Oregon believe we have the second highest unemployment at least in part due to a top-heavy and cumbersome land use and planning structure. At KKPZ, we have four layers of government to deal with. The city, the county, Metro (three county regional planning agency) and LCDC (State of Oregon). Oregon is unique in that all planing is at the state level with decisions driven downward to the local level.

Last fall, there was a major confrontation with the residents of the small town of Boring, just down the road from KKPZ. The residents of Boring passed by initiative city charter amendments which nullified many LCDC and Metro rules. Yes, yes I know... it wasn't boring in Boring.

Why all that matters is that the same set of issues, particularly "steep slope" rules, has surfaced in Happy Valley where the KKPZ transmitter is located. Three months ago, I would have predicted the word "badly" would best describe the outcome.

Over the years I have had to work with Happy Valley over a few planning issues. Until last year, city hall was a converted farm house. I have found the city and the planning department to be professional but more importantly, in touch with the public.

Given the reputation of LCDC and Metro, I have to say I am astonished how the process has worked out. With each step, decisions have been consistent with KKPZ's business operations and needs. I see the hand of Providence at work.

In the "unintended consequences" department, Oregon is pushing hard to replace hydro and coal power with vast wind farms. Well, it turns out that the UK has discovered a new form of wind farm environmental pollution. It seems the spinning blades of wind turbines reflect and Doppler-modulate aircraft radar. By creating vast areas of radar blackout, wind farms are a new threat to air travel. Who knew?

A quick update for those interested in the sun's impact on radio propagation. At the end of May, the sun passed 638 spotless days in the current solar minimum.

As noted via Anthony Watts :“What is so special about 638? We just overtook the original solar cycle, #1, so now the only cycles above this [more quiet] are: cycles of the Maunder minimum, cycles 5 to 7 (Dalton minimum), and cycles 10 + 12 to 15 (unnamed minimum).”

Rocky Mountain Ramblings
The Denver Report
by
Amanda Alexander, CBT
Chief Engineer, CBC - Denver

T1 – Again!

One of the issues we had the month of May was – you guessed it! – T1 problems. At the beginning of the month we had a problem, but it seemed to fix itself before the tech looked at it. Again at the end of the month, we had another T1 problem. I was going to the mountains for a nice Memorial Day weekend and was unable to deal with it myself. Keith Peterson took on this task. Qwest fixed it that night.

Tuesday morning I noticed the T1 was down again. I

called Qwest and they said they would look at it. I waited until 8:30 AM to call our chronic trouble contact at Qwest. She made some calls and got the T1 fixed promptly. It seems that every time it rains the line goes down. Qwest is working on getting us a new T1 since the current one is not reliable. We are waiting to see what they decide. Until then, when it rains, I become rather busy.



Canopy RFI

I will say the month started off with a bang.

Not a transmitter blowing up, just a major problem. We share one of our sites, the KLDC Ruby Hill site, with two other companies and three other radio stations. Jack Roland, chief engineer of the two FM stations that use the tower as an aux site, had to turn on both his backup transmitters there when a reject load failed in a combiner at the main site on Lookout Mountain. After about twenty minutes, this knocked out the Motorola Canopy (STL) for KLDC.

When I first got the call that KLDC was off the air, I immediately looked at Burk. It had been off for an hour. I could not get into anything on the transmitter end, so I headed up to Ruby Hill. I saw the Canopy was down and did the usual reboot of the system. This typically gets it back up. Not this time. Nothing happened. I tried several other things and nothing. I called Ed Dulaney and he suggested everything I had already done. Then I called Jack Roland, and that's when I found out he had turned on both backups for KQMT and KOSI.

Keith came out to the site because I wanted to do some testing at the studio and transmitter ends of the path. Keith got to Ruby before I had left. We went to the cellar and reset the breaker to the tower with the permission of Colorado Public Radio (a "hard reboot"). I had never been to the cellar before... didn't even know it existed. We found the breaker for all power to the tower and reset it. Nothing changed. It was shortly after this that it dawned on me that it was within twenty minutes of Jack turning on his transmitters that we were knocked off. I knew it had to be his site kicking us off.

I should explain here that we have no ISDN STL backup for KLDC because RFI at the site makes it unreliable. We had one for a couple of years, but for some reason, I assume because we are slightly closer to the tower, the RFI level always knocked our ISDN off and we couldn't count on it. We finally got rid of the more expensive ISDN line and put in a regular POTS line.

During all of this, my dad was on a train with my mom heading up to the mountains for their 30th wedding anniversary. I had been talking to him on and off about the problem. On my way back to the office to pick up a Comrex Matrix, he called. It turned out Jack Roland has a Zephyr ISDN unit at the site. Evidently their transmitter room has lower RFI levels and the ISDN there is reliable. We were able to run a long AES cable from their room to ours and dial up our ISDN at the studio, and this got us on the air. Jack was able to get his stations back up on their main transmitters at 7:30 that evening. I waited about an hour and then tried getting our site back up.

I did several reboots of the Canopy and

something was not right. I couldn't quite put my finger on it, though. It took several reboots of the system to get it back on the air. The next morning, I headed to the site for what I hoped would be an easy task. All I wanted to do was disconnect the ISDN and put everything back to normal. I noticed the Intraplex was in alarm again. But the Burk computer showed it was connected, indicating a good Ethernet path to the site. I went back to the studio and rebooted the Intraplex on that end. Still nothing.

Sunday, Keith and I worked hard at getting the Intraplex back up. I had limited time because my parents were coming back in town and I was the ride home. I was able to be at the studio while Keith was at the transmitter. It took me rebooting the audio card. That's all, everything came back up perfectly. Keith was able to disconnect the ISDN and put things back to normal.

After this incident, we worked out a deal with the folks at Entercom. They are to call us whenever they have to turn on their backups – in advance for planned use and as soon as possible during emergencies – so we have time to get our facility on ISDN. Jack has allowed us the use of Entercom's ISDN unit whenever we need it just as long as we check in first. So far, Jack has only had to contact us once about turning on their backups. They ended up waiting until 11 PM to do the work needed, so I had nothing to worry about. Everything came back perfectly.

KLVZ Project

The 18th started the move to the new transmitter building at the KLVZ daytime site north of Brighton, Colorado. This was something I hadn't done before. The morning started off badly. I went to unlock the gate, took our combo lock off and found that it had been bypassed by another lock... we were locked out. It turned out that Jerry Ford, the man that leases the site for pasture, was there the previous day removing his horses from the property and the kid working with him locked the chain wrong. Jerry lives just up the road, so within ten minutes he was there to let us in.

We then began disconnecting all the equipment. We were able to get all the rack equipment moved to the new building in a corner and then began cutting the PVC conduit beneath the old building containing the transmission lines, control and power cables. By the time this was finished, general contractor Mike Kilgore showed up with the trencher. It took him less than half an hour to trench from the new building to the old. We finished cleaning out the old building, moving what could be

moved and disconnecting various power and other cables.

Tuesday was the day of running all the extension cables through PVC conduit and getting them all in the trench. This was a long, tiring day. I think everyone was happy to leave at the end of the day. Showers were definitely a must!

Wednesday, we moved the phasor and transmitter to the new building. Mike Kilgore had to cut a section out of the door frame in the new building to get the phasor enough room to fit. This was an interesting process. Before we could move it into the new building, we needed to help Ryan from Berg Electric and Steve, a friend from my parents' church, get the cables into the building so they could secure the PVC and give us the room needed to move the phasor in.

Thursday was the longest day for my dad and me as we worked from 7:00 AM until 9:30 that night. We began wiring all the equipment up so we

could get back on the day site. My mom was kind enough to bring us dinner that night so we wouldn't have to take the time to stop work and go get food. Keith spent the day getting the security cameras mounted on the building. By that night, we had the transmitter up and running.

Friday was spent fine-tuning everything. Thankfully it was a short day. We were up and running.

This last Thursday in May, we spent another day at the site to do the adjustments and final measurements for the AM modeling application. We were able to set up the site for the model parameters and tune the ATU networks for a match. We were also able to the security contractor out to the site to do some repair work on the alarm system.

I think that about does it for this month. Until next time, that's all folks!

Digital Diary
by
Larry Foltran
Corporate Website & Information Technology Coordinator

Must go faster!

Just last week, I was reading some information about Intel's newest line of processors, the i7, that hit the shelves late in 2008. The article included a comparison between the processors of today and those being manufactured only three to four years ago. The statistics they showed truly surprised me. For example, the time it took for a computer to encode a 30-minute HD video clip only three years ago was 4 hours and 25 minutes. That time has been reduced to 1 hour and 13 minutes with today's processors. To convert one song to MP3 used to take nearly 4 minutes in comparison to the one minute and 34 seconds it does today. It's surprising how far CPU technology has come in such a short time.

Even looking at simply the raw numbers really puts things into perspective. Intel's specifications for the i7 Extreme Edition claim that it

factory clocks at 3.33 GHz, but obviously has quite a bit more potential when overclocked. Just 10 years ago, the hottest CPU on the market was the Pentium III, clocked at a then blazing speed of 450 MHz. That really makes me wonder where we'll be at 10 years from now. Even within a year, Intel's line of processors went from the Core 2 Quad at just under 3.0 GHz to the i7 I mentioned before.



When to say enough is

enough...

A few weeks ago, I received a call from my wife saying that she couldn't print a document from her laptop. My tech support brain jumped into action and I gave her a few different options ranging from rebooting her laptop to rebooting the server. No more than 15 minutes later, she called back saying that neither option had worked and now the server wasn't booting back up. I instantly knew exactly what I

would be doing that evening. My crazy Friday nights!

After inhaling my dinner, I made a bee line to the server to see what the problem was. It didn't take long for me to realize that the hard drive was on its way to cyber heaven. Thank goodness for regular back-ups!

The next day I made the trip to the nearest computer store, unfortunately a good 40 minutes away. A little while later, I arrived home from my excursion to computer geek paradise with the new hard drive in hand. Replacing the old with the new went smoothly and I started the OS installation process. About 10 minutes in, everything went dark. Now what?

After another inspection, I saw that the power supply had died. Whether it was purely coincidence or a result of blowing dust when I cleaned out the case, I truly don't know. What I did know for sure was that my task list had just grown by one additional item. And there was evening, and there was morning —the second day.

The following afternoon I drove back to the computer store, this time for a new power supply.

Everything installed nicely, I confirmed that the cables were all attached properly, and finally hit the power button. Nothing. Power button again. An even bigger nothing. I reconfirmed that the cables were attached properly. Everything looked good. Perhaps a bad power supply? I tested that and it worked fine. I re-tested the old one and it was still dead. I was extremely happy with that result, purely for the sake of my mental state. The reality was that I was left with a non-working computer that consisted of mostly new components (the memory was replaced just a year back). My next option would be to change the motherboard, but would it make sense in the long run? Especially when the local computer store has their no-brand, bare-bones computer with better processing speed than this 10-year-old machine for less than the cost of the new hard drive, power supply, and mother board. Bring me a shovel. This computer is getting buried in the back yard and I'm making another 40 minute drive to the computer store.

...until next month!

The Local Oscillator
June 2009

KBRT • Avalon - Los Angeles, CA
740 kHz, 10 kW-D, DA

KCBC • Riverbank - San Francisco, CA
770 kHz, 50 kW-D/1 kW-N, DA-1

KJSL • St. Louis, MO
630 kHz, 5 kW-U, DA-2

KKPZ • Portland, OR
1330 kHz, 5 kW-U, DA-1

KLZ • Denver, CO
560 kHz, 5 kW-U, DA-1

KLDC • Brighton - Denver, CO
1220 kHz, 660 W-D/11 W-N, ND

KLTT • Commerce City - Denver, CO
670 kHz, 50 kW-D/1.4 kW-N, DA-2

KLVZ • Denver, CO
810 kHz, 2.2 kW-D/430 W-N, DA-2

KSTL • St. Louis, MO
690 kHz, 1 kW-D/18 W-N, ND

WDCX • Rochester, NY
990 kHz, 5 kW-D/2.5 kW-N, DA-2

WDCX • Buffalo, NY
99.5 MHz, 110 kW/195m AAT

WDJC-FM • Birmingham, AL
93.7 MHz, 100 kW/307m AAT

WEXL • Royal Oak - Detroit, MI
1340 kHz, 1 kW-U, DA-D

WLGZ-FM • Webster - Rochester, NY
102.7 MHz, 6 kW/100m AAT

WRDT • Monroe - Detroit, MI
560 kHz, 500 W-D/14 W-N, DA-D

WMUZ • Detroit, MI
103.5 MHz, 50 kW/150m AAT

WPWX • Hammond - Chicago, IL
92.3 MHz, 50 kW/150m AAT

WSRB • Lansing - Chicago, IL
106.3 MHz, 4.1 kW/120m AAT

WYRB • Genoa - Rockford, IL
106.3 MHz, 6 kW/65m AAT

WYCA • Crete - Chicago, IL
102.3 MHz, 1.05 kW/150m AAT

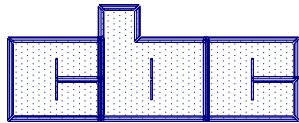
WYDE • Birmingham, AL
1260 kHz, 5 kW-D/41W-N, ND

WYDE-FM • Cullman - Birmingham, AL
101.1 MHz, 100 kW/410m AAT

WXJC • Birmingham, AL
850 kHz, 50 kW-D/1 kW-N, DA-2

WXJC-FM • Cordova-Birmingham, AL
92.5 MHz, 2.2 kW/167m AAT

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